



STATEMENT OF BASIS
Page 1 of 29
BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

DATE APPLICATION RECEIVED: September 26, 2012, additional information through April 14, 2015

FACILITY DESCRIPTION Last comprehensive inspection was performed on October 29, 2013. Minor recordkeeping violation regarding maintaining the start-up and shutdown logs for the boilers was reported; it was resolved on November 24, 2014 (NOV #: 00-8169).

SIC/NAICS codes: 2841/325611, 2842/325612, 2843/325613, 2891/325520 & 2899/325199,

CPJ Technologies is a specialty chemicals manufacturer. It makes esters and polyesters, phosphates, a full range of alcohols, manufactures both water based and solvent based acrylic polymers in both solutions and emulsions, and has custom synthesis capability to make a large variety of products that serve a wide range of industries and applications, including Textile, Automotive, Paper & Packaging, and Fiberglass. All specialty chemicals at the facility are manufactured in batch reactors. Reactors C8, C11, and C13 are dedicated to a single product in which polymerization is carried out in C11 and dilution is carried out in C8 and C13.

No other single reactor is dedicated to a single product. However, products can be split into similar categories by reactor or groups of reactors. Following table (based on 2/14/14 facility's e-mail) presents the list of the types of reactions normally conducted in each reactor at this facility:

Reactor / Mix Tank	Uses
C1	Phosphorylation, solvent polymerization, esterification, blends (normally hot or cold blends of aqueous based raw materials)
C202	PET esterification / transesterification, wax emulsification, blends (normally hot or cold blends of aqueous based raw materials)
C4	Weigh tank for C1
C4A, C4B	Cold blends
C6	Aqueous polymerizations, amidifications
C11	Dedicated solvent polymerization
C8	Dilution of C11 polymers
C13	Dilution of C11 polymers
C14	Aqueous polymerizations, wax emulsification, blends
C15	Aqueous polymerizations, phosphorylation
C215, SD1, SD2, C104, C107	Hot and cold emulsification and dissolution of polymers
LD1, LD2	Cold blends of polymers and inorganics

PROJECT DESCRIPTION - Conditional Major Permit Renewal

There have been community concerns about odor, so the facility will continue to be issued operating permits with a 10-



STATEMENT OF BASIS
Page 2 of 29
BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

yr expiration date.

CHANGES SINCE LAST OP ISSUANCE

Changes in Unit ID 05:

C4 is now a monomer feed tank for C1.

C4A, C4B, and C10 were moved from Unit ID 05 to Unit ID 12.

Changes in Emission Unit ID 06:

-T12 and TK-171 are empty and were moved to the Exempt Sources

-C14 (previously named C214) and C15 (previously named C204) were added to Unit ID 06. They were exempted from construction permitting on July 18, 2011. C15 has a 2000 gal monomer feed tank and a 250 gal catalyst feed tank. C14 has a 5000 gal monomer feed tank and a 250 gal catalyst feed tank.

-Tanks T12 & T34 were moved from the Exempted Sources List to emission unit 06, as sources of Butyl Acrylate and 2-Ethyl Hexyl Acrylate emissions, controlled by the Scrubber TK-020.

Changes in Emission Unit ID 12

-C4A, C4B, and C10 were moved from Unit ID 05 to Unit ID 12.

-The Stack ID for C10 changed to FAN6

-C215 was added to Unit ID 12. It was exempted from permitting in letter from DHEC dated July 18, 2011

Changes in the Control Devices Table

CD03, Reactor 8 caustic Scrubber (Not currently in use (Reactor 8 currently controlled by TK-020) but remains onsite), was voided.

The facility requested that CD06, and CD07, Sulfur Dye Caustic Scrubber 1, and Sulfur Dye Caustic Scrubber 2, that do not control any emissions, remain on-site.

The following equipment was added to the Exempt Sources List based on facility's information e-mailed on 06/28/213.

-B5- 100 hp (3.34 MMBtu/hr) Boiler

-B6-125 hp (4.19 MMBtu/hr) Boiler

-T12-7,800-gallon storage tank (currently empty), previously listed as a non-exempt storage tank Unit ID 06 (this tank was moved back to emission unit 06, based on April 14, 2015 information from the facility).

-TK-171-8,000-gallon storage tank (currently empty), previously listed as a non-exempt storage tank Unit ID 06.

-C202-Polyester Polymerization: 3,500-gallon stainless steel reactor, equipped with a condenser was added to emission unit ID 05. The reactor will be heated by an electric hot oil heater and cooled by a heat exchanger.

-BO4, a natural gas DowTherm Heater (1.0 x 10⁶BTU/hr) that replaced the 2.0 x 10⁶BTU/hr DowTherm Heater previously permitted as Source ID04, was voided.

The following storage tanks were added to the Exemption List per the additional information received on January 9, 2015:

- T60- 6660 gal Storage tank -empty
- T37- 10000 gal Fuel Oil #2 Storage Tank
- T112- 1800 gal; Storage Tank-empty



STATEMENT OF BASIS
Page 3 of 29
 BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

TK-020- 20000gal NaOH Storage Tank

The capacities of the following storage tanks were updated in the Exemption List based on January 9, 2015, information:

Storage tank T70: old information: 4500 gals, new information: 5200 gal

Storage tank T 71: old information: 4500 gals, new information: 5200 gal

Storage tank T164- old information 5000 gal, new information: 4500 gal

Storage tank T165-old information: 8000 gals, new information: 4500 gal

The content of the storage tanks T1-T11, T30-T33, T44, T50 & T52, T60-T71 were denoted "empty" based on January 9, 2015, information. The stored material information will remain unchanged in the new Exemption List for the existing tanks. The new "empty" tanks content will be indicated as "empty" in the updated Exemption Sources List.

Following installed reactors, exempted on October 13, 2010 are included in the emission units at this facility.

Equip ID	Source Description	Basis
C202	Polyester Polymerization: 3,500-gallon stainless steel reactor, equipped with a condenser. This reactor will be heated by an electric hot oil heater and cooled by a heat exchanger.	SC Regulation 61-62.1, Section II (B)(2)(h)
C204	Acrylic Polymerization: 3,500-gallon glass-lined reactor, equipped with a condenser	SC Regulation 61-62.1, Section II (B)(2)(h)
C214	Emulsification Polymerization: 6,000-gallon reactor, equipped with a condenser and routed through an existing scrubber TK-20	SC Regulation 61-62.1, Section II (B)(2)(h)
C215	Hot/Cold Blends: 7,700-gallon stainless steel reactor	SC Regulation 61-62.1, Section II (B)(2)(h)

Pump pressure monitoring was added as an additional indirect monitoring parameter for the wet scrubber in lieu of the liquid flow rate. The liquid flow ranges will be established based on the pump curve that is correlating the pressure with the liquid flow rate.

EMISSIONS

Emission calculation basis for all criteria pollutants for all boilers: AP-42 emission factors and unit rated capacity, as follows:

Design Capacity (MMBtu/hr) x Emission Factor (lb/MMBtu)

Boiler BO1 (facility's comment: "Boiler B01 remains on sight but is unhooked from gas/oil service. May want to keep in permit but we do not expect to use it in the foreseeable future".

Boiler BO1- Distillate (#2) Oil Fired (10 - 100 MMBtu/hr)

Parameters:	Rating: 33.50 MMBTU/hr		
	Hours/year: 8,760	BTU/gal: 140,000	% Sulfur: 0.05



STATEMENT OF BASIS
Page 4 of 29
 BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

Emission Factors:	PM	PM ₁₀	PM _{2.5}	SO ₂	NO _x	CO	VOC	CO ₂	Pb**
lb/10 ³ gal-	3.3	2.3	1.55	7.1	20	5	0.2	22,300	9
Emissions:	PM	PM ₁₀	PM _{2.5}	SO ₂	NO _x	CO	VOC	CO ₂	Pb
lb/hr-	0.7896	0.5504	0.3709	1.6989	4.7857	1.1964	0.0479	5,336.0714	3.0150E-04
ton/yr-	3.46	2.41	1.62	7.44	20.96	5.24	0.21	23,371.99	1.32E-03

Source: AP-42 5th Ed, Tables 1.3-1, -2, -3 -6, 5/2010 Update

Boiler BO1: CO from N/G= 2.75 lb/hr. 12.8 tpy
 Boiler BO1: VOC from N/G=0.1806 lb/hr, 0.79 tpy

**Pb is in units of (lb/10¹² BTU)

Green House Gases (Per Greenhouse Gas Reporting Rule Factors)				
lb/MMBTU-	CO ₂	CH ₄	N ₂ O	
	163	0.00661386	0.001322772	
	CO ₂	CH ₄	N ₂ O	CO ₂ e
	5,462	0.2216	0.0443	5,481
	23,925	0.9705	0.1941	24,007
40 CFR 98, Subpart C, Table A-1, Table C-1 and Table C-2				

Boiler BO2

Boiler 2- Distillate (#2) Oil Fired (< 10 MM Btu/hr)

Parameters:	Rating: 4.31 MMBTU/hr								
	Hours/year: 8,760			BTU/gal: 140,000			% Sulfur: 0.05		
Emission Factors:	PM	PM ₁₀	PM _{2.5}	SO ₂	NO _x	CO	VOC	CO ₂	Pb**
lb/10 ³ gal-	3.3	2.38	2.13	7.1	20	5	0.34	22,300	9
Emissions:	PM	PM ₁₀	PM _{2.5}	SO ₂	NO _x	CO	VOC	CO ₂	Pb
lb/hr-	0.1017	0.0733	0.0656	0.2187	0.6161	0.1540	0.0105	686.9993	3.8817E-05
ton/yr-	0.45	0.32	0.29	0.96	2.70	0.67	0.05	3,009.06	1.70E-04

Boiler BO2: CO from N/G=0.354 lb/hr, 1.55 tpy
 Boiler BO2: VOC from N/G =0.023 lb/hr, 0.1 tpy

**Pb is in units of (lb/10¹² BTU)

Green House Gases (Per Greenhouse Gas Reporting Rule Factors)				
lb/MMBTU	CO ₂	CH ₄	N ₂ O	
	163	0.00661386	0.001322772	
	CO ₂	CH ₄	N ₂ O	CO ₂ e
	703	0.0285	0.0057	706



STATEMENT OF BASIS
Page 5 of 29
 BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

	3,080	0.1249	0.0250	3,091
40 CFR 98, Subpart C, Table A-1, Table C-1 and Table C-2				

Boiler BO3

Boiler 3- Distillate (#2) Oil Fired (< 10 MM Btu/hr)

Parameters:	Rating: 3.45 MMBTU/hr								
	Hours/year: 8,760			BTU/gal: 140,000			% Sulfur: 0.05		
Emission Factors:	PM	PM ₁₀	PM _{2.5}	SO ₂	NO _x	CO	VOC	CO ₂	Pb**
lb/10 ³ gal-	3.3	2.38	2.13	7.1	20	5	0.34	22,300	9
Emissions:	PM	PM ₁₀	PM _{2.5}	SO ₂	NO _x	CO	VOC	CO ₂	Pb
lb/hr-	0.0813	0.0587	0.0525	0.1750	0.4929	0.1232	0.0084	549.5357	3.1050E-05
ton/yr-	0.36	0.26	0.23	0.77	2.16	0.54	0.04	2,406.97	1.36E-04

Boiler BO3: CO from N/G=0.284 lb/hr, 1.24 tpy

Boiler BO3: VOC from N/G =0.08 lb/hr, 0.35 tpy

**Pb is in units of (lb/10¹² BTU)

Green House Gases (Per Greenhouse Gas Reporting Rule Factors)				
lb/MMBTU-	CO ₂	CH ₄	N ₂ O	
	163	0.00661386	0.001322772	
	CO ₂	CH ₄	N ₂ O	CO ₂ e
	563	0.0228	0.0046	564
	2,464	0.0999	0.0200	2,472
40 CFR 98, Subpart C, Table A-1, Table C-1 and Table C-2				

The facility's February 11, 2015, e-mail identified the emission point EPO2 as an exempted 1MM Btu/hr boiler that was re-installed in 2007.

Based on CPJ's review of all current products made, it was determined that the facility emits only the following HAPS: Phthalic anhydride, acrylamide, acrylic acid, ethyl acrylate, ethylene glycol, maleic anhydride, methanol, styrene, triethylamine, toluene, glycol ethers, and xylene.

Based on the Toxic air pollutant modeling analysis for this renewal, the concentrations of the three (3) pollutants with the lowest odor threshold (ethyl acrylate, acrylic acid and triethylamine) from the current CPJ process operations are lower* than their odor threshold concentrations, and the facility has demonstrated compliance with Standard 8 for all air toxics pollutants.

*based on the uncontrolled emissions, including conservatively modeled fugitives, and the EPA's TTN information, acrylic acid and trimethylamine uncontrolled modeled concentrations are still below the respective pollutants odor threshold. Also, E.P.A.'s lowest Ethyl Acrylate level of health concern, the Acute Exposure Guideline Level-1 is 8.3 ppm is almost

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

7000 times the odor threshold. This concentration (8.3ppm=33.98 mg/m³) is much higher than the CPJ's modeled uncontrolled emission concentration.

The individual pollutant emissions from all processes presented in the facility's Sep 20, 2013, potential emission summary spreadsheet (Tables 1 & 2 below) were obtained by summing up the worst-case pollutant emissions from charging, heating, and packaging steps, all calculated by Alternative Control Techniques (ACT) method (EPA-450/R-94-020), as shown in the sample calculations and Table A below

Example (Ark Polymer products made in Reactor C6):

Example Product Produced = 3 batches/month

Acrylic Acid Emission Factor = 0.325 lb/batch

Acrylic Acid emissions (lb/month) = 3 batches/month * 0.325 lb/batch = 0.975 lb/month

An example calculation for the emission factor is provided below:

Reference: ACT EPA450 /R-94-020 February 1994, Methods for Estimating Air Emissions from Chemical Manufacturing Facilities, Vo. II, Ch. 16, August 2007

Emissions from Materials Charging

$$E_{R-i} = \frac{p_i V_i M_i}{453.6 R T t_i}$$

Where,

- E_{R-i} = Emission rate of component i (lbs/h)
- p_i = Partial pressure of component i (atm)
- V_i = Volume of component i (L)
- M_i = Molecular weight of component i (g-mol)
- R = Universal gas constant, 0.082057 L atm g-mol⁻¹ K⁻¹
- T = System temperature (K)
- t_i = Component i charge time (h)

Emissions from Heating

$$W_i = \left(\frac{V_H M_i}{2(453.6)R} \right) \left(\frac{p_{i,1}}{P_T - p_{i,1}} + \frac{p_{i,2}}{P_T - p_{i,2}} \right) \left(\frac{P_T - p_{i,1}}{T_1} - \frac{P_T - p_{i,2}}{T_2} \right) \text{ and } E_{R-i} = \frac{W_i}{t_i}$$

Where,

- E_{R-i} = Emission rate of component i (lbs/h)
- W_i = Weight discharged component i (lb)
- V_H = Reactor headspace volume (L)
- M_i = Gram-molecular weight component i (amu)
- R = Universal gas constant, 0.082057 L atm g-mol⁻¹ K⁻¹

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

- $p_{i,1}$ = Partial pressure component i @ temperature T_1 (atm)
 $p_{i,2}$ = Partial pressure component i @ temperature T_2 (atm)
 P_T = Total system pressure (atm)
 T_1 = Initial system temperature (K)
 T_2 = Maximum system temperature (K)
 t_i = Component i charge time (h)

Emissions from Packaging

$$E_{R-i} = \frac{mp_i V_i M_i}{453.6 R T t_i}$$

Where,

- E_{R-i} = Emission rate of component i (lbs/h)
 m = Number of packages of volume V
 p_i = Partial pressure of component i (atm)
 V_i = Volume of component i (L)
 M_i = Molecular weight of component i (g-mol)
 R = Universal gas constant, 0.082057 L atm g-mol⁻¹ K⁻¹
 T = System temperature (K)
 t_i = Component i charge time (h)

Total estimated emissions are the sum of emissions due charging, heating and packaging.

ACRYLIC ACID

Emissions from Charging:

- E_{R-i} = Emission rate of component i (lbs/hr)
 p_i = 0.004 atm
 V_i = 61.1 L
 M_i = 72.06 g-mol
 R = Universal gas constant, 0.082057 L atm g-mol⁻¹ K⁻¹
 T = 298 K
 t_i = 16 hr

$$E_R = \frac{(0.004)(61.1)(72.06)}{453.6(0.082057)(298)(16)} = 0.0001 \frac{lb}{hr}$$

Charging (lb/batch) = 0.0001 lb/hr * 16 hr/batch = 0.002 lb/batch



STATEMENT OF BASIS
Page 8 of 29
 BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

Emissions from Heating:

W_i = Weight discharged component i (lb)
 V_H = 4074.2 L
 M_i = 72.06 g-mol
 R = Universal gas constant, 0.082057 L atm g-mol⁻¹ K⁻¹
 $p_{i,1}$ = 0.004 (atm)
 $p_{i,2}$ = 0.091 (atm)
 P_T = 1 (atm)
 T_1 = 298 K
 T_2 = 357 K

$$W_1 = \frac{(4074.2)(72.06)}{2(453.6)(0.082057)} = 3943.8$$

$$W_2 = \frac{0.004}{(1 - 0.004)} + \frac{0.091}{(1 - 0.091)} = 0.1041$$

$$W_3 = \frac{(1 - 0.004)}{298} - \frac{(1 - 0.091)}{357} = 0.000796$$

$$W_i = 3943.8 \text{ lb/batch} * 0.1041 \text{ lb/batch} * 0.000796 \text{ lb/batch} = 0.327 \text{ lb/batch}$$

Emissions from Packaging:

E_{R-i} = Emission rate of component i (lbs/hr)
 m = 1
 p_i = 0.004 atm
 V_i = 61.1 L
 M_i = 72.06 g-mol
 R = 298 K
 t_i = 16 hr

$$E_R = \frac{(1)(0.004)(61.1)(72.06)}{453.6(0.082057)(298)(16)} = \frac{0.0001 \text{ lb}}{\text{hr}}$$

$$\text{Packaging (lb/batch)} = 0.0001 \text{ lb/hr} * 16 \text{ hr/batch} = 0.002 \text{ lb/batch}$$

$$\text{Total Acrylic Acid Emission Factor (lb/batch)} = 0.002 + 0.327 + 0.002 = 0.33 \text{ lb/batch}$$

The Summary of the facility's emissions, presented in the facility wide process emission Tables 1 & 2 below is based on the Spreadsheets provided by the facility, explained in the Tables A, B, and C, as follows:

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

Table A

CPJ Technologies (Permit No. 1200-0068) Explanation of Emission Spreadsheets		
Reactor	Spreadsheet	Comment
C1	C1-GTI.xlsx	This represents the worst-case for acrylic acid, glycol ethers, styrene, xylene and triethylamine from C1.
C202	C202-PET-RMS-r20150213.xlsx	This represents the worst-case for ethylene glycol from C1.
	C202_PET-300_r20150313.xlsx	This represents the worst-case for phthalic anhydride and maleic anhydride from C1.
C202	NOTE: Emissions for C1 are the worst-case pollutant from the three spreadsheets presented above.	
C6	C6-MPD75.xlsx	This reactor and reaction (polymerization) represent the highest level of ethyl acrylate use and worst case for C6.
C11, C8	CPJ_PSA_Adhesive_r20130710.xlsx	<ul style="list-style-type: none"> C11 feeds C8 or C13 but neither C8 nor C13 feed each other. The reactors are used exclusively for production of PSA Adhesive and PSA Tall Oil Adhesive. There are two variations of the PSA so C8 may receive one while C13 holds the other. Emissions from PSA_Adhesive_r20130710 are the worst case for C11/C8. Emissions from C13_PSA_Tall_Oil_Adhesive_r20130826 are the worst case for C11/C13.
C11, C13	Confidential information	
C14	C14_M5kQ_20130830.xlsx	This is the worst-case for methanol and formic acid from this vessel.
C15	C15_Res707_r20130829.xlsx	This is the worst-case for styrene and acrylic acid from this vessel.
SD-1 SD-2	SD2-K12r20130903.xlsx and SD1-K12r20130903.xlsx	Reactors SD1 and SD2 are used almost exclusively to make polymer solutions with the highest VOC content. Emissions from these reactors are not controlled and are VOC only.
C215	C215 - 159 r20130903.xlsx	Reactor C215 is used to dissolve PVOH in water. Although most of the MSDSs do not declare any methanol, it is conservatively included in the calculations at 1%.
C4A C4B	N/A	Used as mix and/or letdown tanks for C202, C1, and C3. Conservatively used worst-case emissions from C1.
C10	C10 Coating.xlsx	C10 is a mix tank dedicated to this one product. Raw material MSDSs declare 8.13% VOC, 4% methanol, and 1 -2% triethylamine. This is the worst-case for this reactor.
MT-104	C107-PVP.xlsx	The manufacturers of the raw materials used in these

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

CPJ Technologies (Permit No. 1200-0068) Explanation of Emission Spreadsheets		
Reactor	Spreadsheet	Comment
MT-107	C104-PVP.xlsx	vessels do not declare any HAP or VOC. The tanks should be removed from Unit ID 12; they are currently listed on the Exempt Sources List.
LD1 LD2	LD1 3B Binder.xlsx	LD1 & LD2 show capacities that are different from those in the original permit application. They should be listed as 1500 gal. Only PM is emitted from these tanks.
C2 C3	N/A	Reactor C3 is used for small batches of water-based products with very low volatility. The process usually involves dilution or combining of liquid compounded products. Conservatively assuming 0.1% VOC is emitted from a maximum batch size of 420 gals, batch time of 8 hr, emissions would be 4.2 lb/batch or 0.52 lb/hr. Reactor C2 is currently out of service. If a product is made with a new HAP, new emission calculations will be submitted when C2 is placed into service.
C202 / C4 (monomer feed tank)	C202 - PO r20130903.xlsx	Polyolefin emulsions production is the worst-case emissions for C202. C4 is monomer feed tank and emissions are vented to C202.

Table B

Reactor ID	Condensers	Install Date	Control Device	Vent¹	Exhaust point
C1	1 condenser: reflux or distill	1961	Scrubber TK-20	TK-20	Fan5, FAN6 & FAN7
C202	2 condensers reflux and distill	2011	Scrubber TK-20	TK-20	Fan5, FAN6 & FAN7
C3	None	1961	N/A	Inside plant	Fan5, FAN6 & FAN7
C4	None	2012	N/A	Inside plant	Fan5, FAN6 & FAN7
C4A	None	1962	N/A	Inside plant	Fan5, FAN6 & FAN7
C4B	None	1962	N/A	Inside plant	Fan5, FAN6 & FAN7
C6	2 condensers reflux and distill	1964	Scrubber TK-20	TK-20	FAN3, FAN4



STATEMENT OF BASIS
Page 11 of 29
 BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

Reactor ID	Condensers	Install Date	Control Device	Vent ¹	Exhaust point
C8	Reflux	1964	Scrubber TK-20	TK-20	FAN1, FAN2, FAN8
C10	None	1986	N/A	Inside plant	FAN8
C11	2 condensers reflux and distill	1969	Scrubber TK-20	TK-20	FAN3, FAN4
C13	None	2009	N/A	Inside plant	FAN1, FAN2, FAN8
C14	2 condensers reflux and distill	2013	Scrubber TK-20	TK-20	FAN1, FAN2, FAN8
C15	2 condensers reflux and distill	2013	Scrubber TK-20	TK-20	FAN1, FAN2, FAN8
LD1	None	1969	N/A	Inside plant	F07, F08, EP04
LD2	None	1980	N/A	Inside plant	F07, F08, EP04
C104	None	1999	N/A	Inside plant	FAN11, F10, F11
C107	None	1999	N/A	Inside plant	FAN11, F10, F11
SD1	None	1987	N/A	Inside plant	FAN9, FAN10, F10, F11
SD2	None	1987	N/A	Inside plant	FAN11, FAN12
C215	None	2012	N/A	Outside plant	
Ribbon Blender	N/A	2012	N/A	Inside plant	
PP1	2 condensers reflux and distill	1964	N/A	Outside plant	
PP2	2 condensers reflux and distill	1973	N/A	Outside plant	
PP3	1 condenser: reflux or distill	1979	N/A	Outside plant	

1) TK-20 is Scrubber Emission Point; other sources vented to atmosphere by general room exhaust fan (see Fan ID).

Table C

Equipment ID	FAN ID	Fan Type
C1, C202, C3, C4, C4A, C4B	FAN5, FAN6, FAN7	WINDOW
C6, C11	FAN4, FAN3	WINDOW



STATEMENT OF BASIS
Page 12 of 29
 BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

C8, C10, C13, C14, C15	FAN1, FAN2, FAN008	WINDOW
LD1, LD2	EP04, F07, F08	WINDOW, Lowered Vents F07, F08
SD1, SD2, C104, C107, C215	FAN009, FAN011, FAN012, FAN10	WINDOW
Finished Goods Warehouse	FAN014, FAN015, FAN016	ROOF with rain cap

Changes were made in EU 05 emission tables based on February 13, 2015 additional emission information; reactor C1 entries were changed to reactor C202 because reactor C202 products are the worse case for the two PET processes. (see below)

Product: C202-PET-RMS-r20150213.xlsx

Reactor C1, SS 2000 gal

Standard Batch: 15000 lb

Batch Time: 60 hr

Emissions Summary Compound	Emissions		Particulate Matter	
	lb/hr	lb/batch	lb/hr	lb/batch
PEG 1450	3.41E-04	0.020	0.002	0.143
Ethylene Glycol	7.47E-04	0.045	0	0
Terephthalic Acid	0.001	0.063	8.13E-04	0.049
Isophthalic Acid	0.001	0.063	3.84E-04	0.023
Monobutyltin Oxide	3.09E-04	0.019	4.50E-06	2.70E-04
2,2'-Methylene-bis(4-methyl-6-tert-butylphenol)	2.72E-04	0.016	3.18E-06	1.91E-04
TOTAL VOC	0.004	0.227		
TOTAL PM			0.004	0.215

Product: C202_PET_300_r20150313.xlsx

Reactor C202, SS 2000 gal

Standard Batch: 15000 lb

Batch Time: 48 hr

Product: C202-PET-RMS-r20150213.xlsx

Emissions Summary Compound	Emissions		Particulate Matter	
	lb/hr	lb/batch	lb/hr	lb/batch
Diethylene Glycol	0.001	0.071	0	0
POE (17) Glycerol	2.18E-04	0.010	0	0
Neopentyl Glycol	6.30E-06	3.02E-04	0.001	0.067
Pentaerythritol	2.33E-11	1.12E-09	0.002	0.113
Tetrapropylorthotitanate	1.45E-06	6.98E-05	0	0
PET	0	0	5.58E-04	0.027
Phthalic Anhydride	1.47E-06	7.07E-05	0.003	0.125
Maleic Anhydride	2.02E-06	9.72E-05	4.69E-04	0.023



STATEMENT OF BASIS
Page 13 of 29
 BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

TOTAL VOC	0.002	0.082		
TOTAL PM			0.007	0.354

The following additional emission information regarding the Ribbon Blender#1 for oxidation of polyethylene was received on January 9, 2015. As previously discussed with the facility, this equipment belongs to EU 12.

VOC: Since yield is at or sometimes greater than 100% due to incorporation of oxygen, and VOC from this process is small and not well characterized, mass balance cannot be used to determine VOC emissions. Therefore, conservative estimate is that 0.1% of product is lost as uncontrolled VOC. Process time is 72 hr and batch size is 5400 lb, therefore $8760/72 \times 5400 = 657000$ lb polyethylene processed maximum lbs per year). PTE is $657000 \times 0.1\% = 657$ lb VOC or 0.3285 tpy.

PM: The PM emissions from this source (Particle size: 100 – 300 μ m) are estimated h based on 2.31 lb (1047g) PM collected from a 5400 lb batch = 2.31 lb/batch: $2.31 \text{ lb/batch} \times 1 \text{ batch/72hr} = 0.0321 \text{ lb/hr}$ or 0.141 tpy.

Uncontrolled emissions

Table 1 Uncontrolled Emission Summary by emission unit

UNIT ID	EQUIP ID	Source of Emission Estimates	VOC	PM	Acrylamide	Acrylic acid	Ethylene Glycol	Ethyl Acrylate	Glycol Ethers	Maleic Anhydride
			N/A	N/A	79-06-1	79-10-7	107-21-1	140-88-5	N/A	108-31-6
					HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP
05	C1	C1-GTI.xlsx	0.145			0.009			0.013	
05	C202	C202-PET-RMS-r20150213.xlsx	0.004	0.004			7.47E-04			
05	C202	C202_PET-300_r20150313.xlsx	0.002	0.070						2.02E-06
WORST-CASE (LB/HR)			0.151	0.07	0	0.009	7.47E-04	0	0.013	2.02E-06
TOTALS (TPY)			0.636	0.306	0	0.039	0.0032	0	0.057	8.80E-06
06	C6	C6-MPD75.xlsx, C6_AM_20130830.xlsx	0.118		9.30E-05	0.118		0.066		
06	C11, C8 (See Note 1.)	CPJ_PSA_Adhesive_r20130710.xlsx	0.620			0.020				
06	C11, C13 (See Note 1.)	C13 PSA_Tall Oil_Adhesive_r20130826.xlsx	0.698							
06	C14	C14_M5kQ_20130830.xlsx	0.004	0.280						
06	C15	C15_Res707_r20130829.xlsx	0.133			0.030				
TOTALS (LB/HR)			1.573	0.280	9.30E-05	0.168	0	0.066	0	0



STATEMENT OF BASIS
Page 14 of 29
 BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

UNIT ID	EQUIP ID	Source of Emission Estimates	VOC	PM	Acrylamide	Acrylic acid	Ethylene Glycol	Ethyl Acrylate	Glycol Ethers	Maleic Anhydride
			N/A	N/A	79-06-1	79-10-7	107-21-1	140-88-5	N/A	108-31-6
					HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP
TOTALS (TPY)			6.890	1.226	4.07E-04	0.738	0	0.289	0	0
12	SD-1	SD1-K12 r20130903.xlsx	0.442							
12	SD-2	SD2-K12 r20130903.xlsx	0.442							
12	C215	C215 - 159 r20130903.xlsx	0.004	0.079						
12	C4A	Used as mix and/or letdown tanks for C202, C1, and C3. Conservatively used worst-case emissions from C1.	0.145	0.010	0	0.009	9.82E-04	0	0.013	1.05E-06
12	C4B		0.145	0.010	0	0.009	9.82E-04	0	0.013	1.05E-06
12	C10	C10 Coating.xlsx	0.013							
TOTALS (LB/HR)			1.191	0.099	0	0.018	0.002	0	0.026	2.10E-06
TOTALS (TPY)			5.217	0.434	0	0.079	0.009	0	0.114	9.20E-06
Exempt	MT-104	C107-PVP.xlsx								
Exempt	MT-107	C104-PVP.xlsx								
Exempt	LD1	LD1 3B Binder.xlsx		0.019						
Exempt	LD2	LD1 3B Binder.xlsx		0.019						
Exempt	C2	See Note 2.	0.520							
Exempt	C3		0.520							
Exempt	C202 / C4 (monomer feed tank)	C202 - PO r20130903.xlsx	0.099	0.077						
TOTALS (LB/HR)			1.139	0.115	0	0	0	0	0	0
TOTALS (TPY)			4.989	0.504	0	0	0	0	0	0
FACILITY TOTAL (LB/HR)			4.048	0.564	9.30E-05	0.195	0.003	0.066	0.039	4.12E-06
FACILITY TOTAL (TPY)			17.731	2.47	4.07E-04	0.856	0.013	0.289	0.171	1.80E-05

Table 1 Uncontrolled Emission Summary by emission unit cont.



STATEMENT OF BASIS
Page 15 of 29
 BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

UNIT ID	EQUIP ID	Source of Emission Estimates	Methanol	Phthalic Anhydride	Styrene	Toluene	Triethylamine	Xylene	TOTAL HAP	Formic Acid
			67-56-1	85-44-9	100-42-5	108-88-3	121-44-8	1330-20-7		64-18-6
			HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	TAP
05	C1	C1-GTI.xlsx			0.008		0.014	0.025	0.069	
05	C202	C202-PET-RMS-r20150213.xlsx							7.47E-04	
05	C202	C202_PET - 300_r20150313.xlsx		1.47E-06					3.49E-06	
WORST-CASE (LB/HR)			0	1.47E-06	0.008	0	0.014	0.025	0.069	0
TOTALS (TPY)			0	6.44E-06	0.035	0	0.061	0.110	0.302	0
06	C6	C6-MPD75.xlsx, C6_AM_20130830.xlsx						0.160	0.184	0
06	C11, C8 (See Note 1.)	CPJ_PSA_Adhesive_r20130710.xlsx	0.014					0.699	0.035	0
06	C11, C13 (See Note 1.)	C13_PSA_Tall Oil_Adhesive_r20130826.xlsx	0.002			0.018			0.020	
06	C14	C14_M5k Q_20130830.xlsx	0.002						0.002	2.47E-04
06	C15	C15_Res707_r20130829.xlsx			0.007				0.037	
TOTALS (LB/HR)			0.018	0	0.007	0.018	0	0	0.278	2.47E-04
TOTALS (TPY)			0.080	0	0.031	0.079	0	0	1.216	0.001
12	SD-1	SD1-K12r20130903.xlsx							0	



STATEMENT OF BASIS
Page 16 of 29
 BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

UNIT ID	EQUIP ID	Source of Emission Estimates	Methanol	Phthalic Anhydride	Styrene	Toluene	Triethylamine	Xylene	TOTAL HAP	Formic Acid
			67-56-1	85-44-9	100-42-5	108-88-3	121-44-8	1330-20-7		64-18-6
			HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	TAP
12	SD-2	SD2-K12 r2013090 3.xlsx							0	
12	C215	C215 - 159 r2013090 3.xlsx	0.004						0.004	
12	C4A	Used as mix and/or letdown tanks for C202, C1, and C3. Conservatively used worst-case emissions from C1		7.63E-07	0.008	0	0.014	0.025	0.069	
12	C4B			7.63E-07	0.008	0	0.014	0.025	0.069	
12	C10	C10 Coating.xlsx	0.006				0.002		0.008	
TOTALS (LB/HR)			0.010	1.53E-06	0.016	0	0.003	0.050	0.150	0
TOTALS (TPY)			0.044	6.68E-06	0.070	0	0.131	0.219	0.657	

Exempt	MT-104	C107-PVP.xlsx								
Exempt	MT-107	C104-PVP.xlsx								
Exempt	LD1	LD1 3B Binder.xlsx								
Exempt	LD2	LD1								



STATEMENT OF BASIS
Page 17 of 29
 BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

		3B Binder.xlsx								
Exempt	C2	See Note 2.								
Exempt	C3									
Exempt	C202 / C4 (monomer feed tank)	C202 - PO r2013 0903.xlsx			0	0	0	0	0	
TOTALS (TPY)			0	0	0	0	0	0	0	
FACILITY TOTAL (LB/HR)			0.028	2.29E-06	0.031	0.018	0.044	0.075	0.497	2.47E-04
FACILITY TOTAL (TPY)			0.124	1.00E-05	0.136	0.079	0.193	0.329	2.176	0.001

Note 1. C11 feeds C8 or C13 but neither C8 nor C13 feed each other. The reactors are used exclusively for the PSA Adhesive and PSA_Tall Oil_Adhesive. There are two variations of the PSA so C8 may receive one while C13 holds the other. Emissions from C13 PSA_Tall Oil_Adhesive_r20130826 are the worst case for C11/C13 and emissions from PSA_Adhesive_r20130710 are the worst case for C11/C8.

Note 2: Reactor C3 is used for small batches of water-based products with very low volatility. The process usually involves dilution or combining of liquid compounded products. Conservatively assuming 0.1% VOC is emitted from a maximum batch size of 420 gals, batch time of 8 hr, emissions would be 4.2 lb/batch or 0.52 lb/hr. Reactor C2 is currently out of service. If a product is made with a new HAP, new emission calculations will be submitted when C2 is placed into service.

Summary of Uncontrolled Emissions for Pollutants with Low Odor Threshold (lb/hr)

UNIT ID	EQUIP ID	Source of Emission Estimates	Acrylic acid	Butyl Acrylate	Ethyl Acetate	Ethyl Acrylate
			79-10-7	141-32-2	141-78-6	140-88-5
			HAP, TAP	N/A	N/A	HAP, TAP
05	C1	C1-GTI.xlsx	0.009	0.076		
06	C6	C6-MPD75.xlsx, C6_AM_20130830.xlsx	0.118			0.066
06	C15	C15_Res707_r20130829.xlsx	0.030	0.078		
06	C11, C8	CPJ_PSA_Adhesive_r20130710.xlsx	0.020	0.039	0.207	
12	C4A	Used as mix and/or letdown tanks for C202, C1, and C3.	0.009			



STATEMENT OF BASIS
Page 18 of 29
 BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

12	C4B	Conservatively used worst-case emissions from C1.	0.009			
FACILITY TOTAL (LB/HR)			0.388*	0.193***	0.207***	0.131**
FACILITY TOTAL (TPY)			1.682	0.847	0.907	0.574

* includes 0.849 lb/hr fugitive acrylic acid

** includes 0.286 lb/hr fugitive ethyl acrylate

*** Process emissions

Controlled emissions

Scrubber TK-020 controls emissions from:

- (1) C1
- (2) C202
- (3) C6
- (4) C8
- (5) C11 dedicated to one process
- (6) C13
- (7) C14
- (8) C15
- (11) Butyl Acrylate Tank (T12)
- (12) Ethylhexyl Acrylate Tank (T34)

Table 2 Controlled emissions Summary by emission unit

UNIT ID	EQUIP ID	Source of Emission Estimates	VOC	PM	Acrylamide	Acrylic acid	Ethylene Glycol	Ethyl Acrylate	Glycol Ethers	Maleic Anhydride
			N/A	N/A	79-06-1	79-10-7	107-21-1	140-88-5	N/A	108-31-6
					HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP
05	C1	C1-GTI.xlsx	0.007			4.50E-04			6.50E-04	
05	C202	C202-PET-RMS-r20150213.xlsx	2.50E-04	0.004			4.91E-05			
05	C202	C202_PET-300_r20150313.xlsx	5.00E-05	0.010						5.25E-08
WORST-CASE (LB/HR)			0.007	0.010	0	4.50E-04	4.91E-05	0	6.50E-04	5.25E-08
TOTALS (TPY)			0.032	0.044	0	0.002	2.15E-04	0	0.003	2.30E-07
06	C6	C6-MPD75.xlsx,	0.006		4.65E-06	0.006		0.003		



STATEMENT OF BASIS
Page 19 of 29
 BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

UNIT ID	EQUIP ID	Source of Emission Estimates	VOC	PM	Acrylamide	Acrylic acid	Ethylene Glycol	Ethyl Acrylate	Glycol Ethers	Maleic Anhydride
			N/A	N/A	79-06-1	79-10-7	107-21-1	140-88-5	N/A	108-31-6
					HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP
		C6_AM_20130830.xlsx								
06	C11, C8 (See Note 1.)	CPJ_PSA_Adhesive_r20130710.xlsx	0.031			0.001				
06	C11, C13 (See Note 1.)	C13_PSA_Tall Oil_Adhesive_r20130826.xlsx	0.035							
06	C14	C14_M5kQ_20130830.xlsx	2.00E-04	0.014						
06	C15	C15_Res707_r20130829.xlsx	0.007			0.002				
TOTALS (LB/HR)			0.079	0.014	4.65E-06	0.008	0	0.003	0	
TOTALS (TPY)			0.345	0.061	2.04E-05	0.037	0	0.014	0	
12	SD-1	SD1-K12_r20130903.xlsx	0.442							
12	SD-2	SD2-K12_r20130903.xlsx	0.442							
12	C215	C215 - 159_r20130903.xlsx	0.004	0.079						
12	C4A	Used as mix and/or letdown tanks for C202, C1, and C3.	0.145	0.010	0	0.009	9.82E-04	0	0.013	1.05E-06
12	C4B	Conservatively used worst-case emissions from C1.	0.145	0.010	0	0.009	9.82E-04	0	0.013	1.05E-06
12	C10	C10	0.013							



Snezana Popova
August 15, 2016

UNIT ID	EQUIP ID	Source of Emission Estimates	VOC	PM	Acrylamid e	Acrylic acid	Ethylene Glycol	Ethyl Acrylate	Glyco l Ether s	Maleic Anhydrid e
			N/A	N/A	79-06-1	79-10-7	107-21-1	140-88-5	N/A	108-31-6
					HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP
		Coating.xlsx								
TOTALS (LB/HR)			1.192	0.099	0	0.018	0.00196	0	0.026	2.1E-06
TOTALS (TPY)			5.22	0.434	0	0.0788	0.008584	0	0.113	9.19E-06
12	MT-104	C107-PVP.xlsx								
12	MT-107	C104-PVP.xlsx								
Exemp t	LD1	LD1 3B Binder.xlsx		0.019						
Exemp t	LD2	LD1 3B Binder.xlsx		0.019						
Exemp t	C2	See Note 2.	0.520							
Exemp t	C3		0.520							
Exempt	C202 / C4 (mono mer feed tank)	C202 - PO r20130903.xl sx	0.005	0.004						
TOTALS (LB/HR)			1.045	0.042	0	0	0	0	0	0
TOTALS (TPY)			4.577	0.183	0	0	0	0	0	0
FACILITY TOTAL (LB/HR)			2.32	0.165	4.65E-06	0.0272	0.0020	0.003	0.0267	2.1E-06
FACILITY TOTAL (TPY)										

[illegible]

STATEMENT OF BASIS
Page 21 of 29
BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

UNIT ID	EQUIP ID	Source of Emission Estimates	Methanol	Phthalic Anhydride	Styrene	Toluene	Triethylamine	Xylene	TOTAL HAP	Formic Acid
			67-56-1	85-44-9	100-42-5	108-88-3	121-44-8	1330-20-7		64-18-6
			HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	TAP
		r20150213.xlsx								
05	C202	C202_PET-300_r20150313.xlsx		3.82E-08					9.07E-08	
WORST-CASE (LB/HR)			0	3.82E-08	4.00E-04	0	7.00E-04	0.001	0.003	0
TOTALS (TPY)			0	1.67E-07	0.002	0	0.003	0.005	0.015	0
06	C6	C6-MPD75.xlsx, C6_AM_20130830.xlsx							0.009	
06	C11, C8 (See Note 1.)	CPJ_PSA_Adhesive_r20130710.xlsx	7.10E-04						0.002	
06	C11, C13 (See Note 1.)	C13_PSA_Tall Oil_Adhesive_r20130826.xlsx	1.00E-04			9.00E-04			0.001	
06	C14	C14_M5kQ_20130830.xlsx	1.00E-04						1.00E-04	1.24E-05
06	C15	C15_Res707_r20130829.xlsx			3.50E-04				0.002	
TOTALS (LB/HR)			9.10E-04	0	3.50E-04	9.00E-04	0	0	0.014	1.24E-05
TOTALS (TPY)			0.004	0	0.002	0.004	0	0	0.061	5.41E-05
12	SD-1	SD1-K12_r20130903.xlsx							0	
12	SD-2	SD2-K12_r20130903.xlsx							0	
12	C215	C215 - 159_r20130903.xlsx	0.004						0.004	
12	C10	C10 Coating.xlsx	0.006				0.002		0.008	
12	C4A	Used as mix	0	7.63E-07	0.008	0	0.014	0.025	0.069	0



STATEMENT OF BASIS
Page 22 of 29
 BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

UNIT ID	EQUIP ID	Source of Emission Estimates	Methanol	Phthalic Anhydride	Styrene	Toluene	Triethylamine	Xylene	TOTAL HAP	Formic Acid
			67-56-1	85-44-9	100-42-5	108-88-3	121-44-8	1330-20-7		64-18-6
			HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	HAP, TAP	TAP
12	C4B	and/or letdown tanks for C202, C1, and C3. Conservatively used worst-case emissions from C1.	0	7.63E-07	0.008	0	0.014	0.025	0.069	0
TOTALS (LB/HR)			0.010	1.53E-06	0.0167	0	0.03	0.050	0.150	0
TOTALS (TPY)			0.044	6.68E-06	0.073	0	0.134	0.219	0.657	0

12	MT-104	C107-PVP.xlsx								
12	MT-107	C104-PVP.xlsx								
Exempt	LD1	LD1 3B Binder.xlsx								
Exempt	LD2	LD1 3B Binder.xlsx								
Exempt	C2	See Note 2.								
Exempt	C3									
Exempt	C202 / C4 (monomer feed tank)	C202 - PO r20130903.xlsx	0	0	0	0	0	0	0	0
TOTALS (TPY)			0	0	0	0	0	0	0	0
FACILITY TOTAL (LB/HR)			0.011	1.56E-06	0.0167	9.00E-04	0.0306	0.051	0.167	2.26E-04
FACILITY TOTAL (TPY)			0.048	6.8E-06	0.0733	0.004	0.134	0.223	0.731	9.9E-04

Note 1. C11 feeds C8 or C13 but neither C8 nor C13 feed each other. The reactors are used exclusively for the PSA Adhesive and PSA_Tall Oil_Adhesive. There are two variations of the PSA so C8 may receive one while C13 holds the other. Emissions from C13 PSA_Tall Oil_Adhesive_r20130826 are the worst case for C11/C13 and emissions from PSA_Adhesive_r20130710 are the worst case for C11/C8.



STATEMENT OF BASIS
Page 23 of 29
 BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

Note 2: Reactor C3 is used for small batches of water-based products with very low volatility. The process usually involves dilution or combining of liquid compounded products. Conservatively assuming 0.1% VOC is emitted from a maximum batch size of 420 gals, batch time of 8 hr, emissions would be 4.2 lb/batch or 0.52 lb/hr. Reactor C2 is currently out of service. If a product is made with a new HAP, new emission calculations will be submitted when C2 is placed into service.

Process emissions:

Facility wide process emissions		
Pollutant	Uncontrolled Emissions	Controlled/Limited Emissions
	TPY	TPY
VOC	17.731	10.170
PM	2.47	0.722
PM10	2.47	0.722
PM2.5	2.47	0.722
PM (combustion)	4.27	N/A
PM10 (combustion)	2.96	N/A
PM2.5(combustion)	1.96	N/A
VOC (combustion)	1.24	N/A
SO ₂	9.17	N/A
NO _x	25.82	N/A
CO	15.59	N/A
Acrylamide	4.07E-04	0.000424
Acrylic Acid	0.856	0.119
Ethylene Glycol	0.013	0.00876
Ethyl Acrylate	0.289	0.014
Glycol Ethers	0.171	0.117
Maleic Anhydride	1.8E-05	9.2E-06
Methanol	0.124	0.048
Phthalic Anhydride	1.0E-05	6.8E-06
Styrene	0.136	0.0733
Toluene	0.079	0.004
Triethylamine	0.193	0.134
Xylene	0.329	0.223
Total HAPs	2.176	0.743
Formic Acid	0.001	5.41E-05

February 21, 2014, information presented 0.727 tpy VOC storage tanks emissions shown in the Table below, the tank and reactor nitrogen purging VOC emissions, estimated at 9134 lb/yr.¹ (4.56 tpy), and the fugitive VOC emissions as shown in Table 3 below.

Storage Tank	Contents	TANKS 4.09d Losses, lb/yr
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STATEMENT OF BASIS
Page 24 of 29
 BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

T-42	Heptane	122
T-43	Isopropanol	30
T-45	Ethyl Acetate	1160
T34**	2-Ethylhexyl Acrylate	155.75*
T12**	Butyl acrylate	24.55*

* Estimate based on Octane and n-butanol, respectively.

**Based on Apr 14, 2015 facility's information the 6000-gallon Butyl Acrylate and 2-Ethylhexyl Acrylate DOT storage tanks referred to as BA and EHA, respectively, will not be used after these materials are moved to existing exempted fixed storage tanks, T12 and T34. The emission increase (35.3 lb/hr VOC) from the tanks replacement will be exempted based on SC Regulation 61-62.1, Section II (B) (2) (h). The transfer to T12 and T34 is expected to take place in the next 60 to 90 days. DOT storage tanks BA and EHA will be removed from the facility.

¹ Reactor Nitrogen purging estimates: Used 2,340,000 SCF of nitrogen in 2013. Density of Nitrogen at STP is 0.078072 lb/ft³. So, 182,688 lb N₂/yr is plant-wide N₂ use. Assuming conservatively that N₂ used carries 5% of its weight as VOC, then VOC emitted is 9134 lb/yr.

Based on facility's information, Butyl Acrylate and 2-Ethylhexyl Acrylate are unloaded from tank trucks by applying nitrogen pressure to the delivering tank truck. Emissions are vented to Caustic Scrubber TK-020. Nitrogen is used to pressurize tank trucks to reduce the risk of fire. Ethyl Acetate, Heptane and Isopropanol are unloaded from tank trucks by applying nitrogen pressure to the delivering tank truck. Emissions are vented to the atmosphere.

Storage tanks T1-T11, T30-T33, T44, T50 & T52, T60-T71 are empty, according to facility's information e-mailed on January 9, 2015 that included also NO₂ Fuel oil storage tanks T36 & T37 and the 5000 gal caustic storage tank TK-020. Tanks T61 through T82 are inside. All others are outside storage tanks.

Table 3 Fugitive emissions

Equipment	Valves	Pumps	Flanges/ Connectors	Relief Valve	Sampling Connections	Open Ended Lines	Total Emissions (lb/hr)
Emission Factors (kg/hr):	0.00403	0.0199	0.00183	0.104	0.015	0.0017	
Emission Factors (lb/hr):	0.00888615	0.0438795	0.00403515	0.22932	0.033075	0.0037485	
C202	0.06220305	0.0438795	0.10087875	0.22932	0.033075	0.0037485	0.4731048
C1	0.0533169	0.0438795	0.08473815	0.22932	0.033075	0.0037485	0.4480781
C6	0.09774765	0.0438795	0.17351145	0.22932	0.033075	0.0037485	0.5812821
C11	0.36433215	0.175518	0.24614415	0.22932	0.033075	0.0037485	1.0521378
C8	0.02665845	0.0438795	0.05245695	0.22932	0.033075	0.0037485	0.3891384
C13	0.02665845	0.1316385	0.0242109	0	0.033075	0.0037485	0.2193314
C14	0.0355446	0.0438795	0.06052725	0.22932	0.033075	0.0037485	0.4060949



STATEMENT OF BASIS
Page 25 of 29
 BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

C15	0.0533169	0.0438795	0.0887733	0.22932	0.033075	0.0037485	0.4521132
Column Totals:	0.71977815	0.5704335	0.8312409	1.60524	0.2646	0.029988	4.0212806
							4.0212806
							96.510733 lb VOC/day
							17.613209 tons VOC/yr

Table 4

Equipment	Valves	Pumps	Flanges/ Connectors	Relief Valve	Sampling Connections	Open Ended Lines
C202	7	1	25	1	1	1
C1	6	1	21	1	1	1
C6	11	1	43	1	1	1
C11	41	4	61	1	1	1
C8	3	1	13	1	1	1
C13	3	3	6	0	1	1
C14	4	1	15	1	1	1
C15	6	1	22	1	1	1

Fugitive HAP emissions from valves, seals, flanges etc. (please see Tables 3 & 4 above) were calculated using the following percent distribution based on the potential process HAP emissions (from Table 2 above):

Acrylic acid: 4.8%
 Ethyl Acrylate: 1.62%
 Methanol: 0.699%
 Styrene: 0.76%
 Toluene: 0.44%
 Triethylamine: 1.08%
 Xylene: 1.85%
 Glycol Ethers: 0.96%

Total uncontrolled HAP emissions = 12.27% of the total uncontrolled VOC process emissions



STATEMENT OF BASIS
Page 26 of 29
 BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

Following are the facility wide emissions including process, storage tanks, combustion, nitrogen pugging and fugitive emissions

FACILITY WIDE EMISSIONS		
Pollutant	Uncontrolled Emissions	Total
	TPY	TPY
VOC	41.85	33.057*
PM	6.478	4.99°
PM10	5.198°	3.68°
PM2.5	4.34	2.68 °
SO ₂	9.17	N/A
NO _x	25.82	N/A
CO	15.59	N/A
Acrylamide	0.00081	4.24E-04°
Acrylic Acid	1.685	0.963°
Ethylene Glycol	0.025	0.0216°
Ethyl Acrylate	0.575	0.3°
Glycol Ethers	0.34	0.286°
Maleic Anhydride	3.58E-05	2.76E-05
Methanol	0.247	0.171°
Phthalic Anhydride	2.0E-05	1.67E-05
Styrene	0.271	0.207°
Toluene	0.157	0.082°
Triethylamine	0.383	0.325°
Xylene	0.655	0.548°
Total HAPs	4.34	2.90
Formic Acid	0.002	0.001

* VOC emission from process (including combustion VOCs), fugitive VOCs, from storage tanks and nitrogen purging (18.97 + 0.727+ 17.6 +4.56) = 41.85 VOC tpy uncontrolled. The controlled VOC from the processes are 10.17 tpy. Total emitted VOC: (10.17 + 0.727+17.6 +4.56) =33.057 tpy VOC

Adding the emissions from each individual fugitive HAP, calculated on the basis of its percentage of the total uncontrolled VOC emissions, to the respective HAP potential controlled process emissions, will result in the following total HAP emissions:

Sample calculation for Ethyl Acrylate: 17.6 tpy fugitive VOC emissions X 1.62 % EA emissions + 0.014 tpy controlled EA process emissions =0.3 tpy total EA emissions,

°Acrylic acid: 0.119 + 0.849= 0.963 tpy (0.219 lb/hr)

°Methanol: 0.048 + 0.123= 0.171 tpy (0.039 lb/hr)

°Styrene: 0.0733 + 0.135= 0.207 tpy (0.047 lb/hr)

°Toluene: 0.004 + 0.078=0.082 tpy (0.0186 lb/hr)

°Triethylamine: 0.134 + 0.19 = 0.325 tpy (0.048 lb/hr)



STATEMENT OF BASIS
Page 27 of 29
 BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

°Xylene: $0.223 + 0.326 = 0.548$ tpy (0.125 lb/hr)
 °Glycol Ethers: $0.117 + 0.169 = 0.286$ tpy (0.0062 lb/hr)
 °Ethyl Acrylate: $0.014 + 0.286 = 0.3$ tpy (0.0684 lb/hr)
 °Ethylene Glycol: $0.00876 + 0.0129 = 0.0216$ tpy (0.0049 lb/hr)
 °Maleic Anhydride: $9.2 \times 10^{-6} + 2.61 \times 10^{-6} = 2.7 \times 10^{-5}$ (6.1 $\times 10^{-6}$ lb/hr)
 °Phthalic Anhydride: $9.25 \times 10^{-6} + 1.78 \times 10^{-5} = 1.78 \times 10^{-5}$ tpy (4 $\times 10^{-6}$ lb/hr)
 °Acrylamide: $2.04 \times 10^{-5} + 4.039 \times 10^{-4} = 4.24 \times 10^{-4}$ tpy (9.6 $\times 10^{-5}$ lb/hr)
 °Formic Acid: $5.41 \times 10^{-5} + 9.9 \times 10^{-4} = 0.001$ tpy (0.00023 lb/hr)

°° Total (process + combustion) controlled PM/PM10/PM2.5 emissions.

$[0.722 + 4.27 \text{ tpy}] =$ 4.99 tpy PM (1.13 lb/hr)
3.68 tpy $[0.722 + 2.96$ tpy] = 3.68 tpy (0.68 lb/hr)
2.68 tpy $[0.722 + 1.96 \text{ tpy}]$ = 2.68 tpy (0.61 lb/hr)

REGULATORY APPLICABILITY REVIEW

Regulation	Comments/Periodic Monitoring Requirements					
Section II.E - Synthetic Minor	This project is for the renewal of a conditional major operating permit. The facility-wide emissions are less than major source thresholds. Its current conditional major permit has federally enforceable limit on VOC emissions to be less than 100 TPY and HAP emissions to be less than 10/25 TPY for single/total HAP to avoid Title V and MACT applicability.					
Standard No. 1	The Boilers are subject to 20% opacity as being constructed after 2/11/1971 (Section I). Also, they are limited to 2.3 lb/MMBtu SO ₂ and 0.6 lb/MMBtu PM. There are no monitoring requirements for opacity since the source is not major, and no PM and SO ₂ requirements because the uncontrolled emissions are considerably less than the allowable, as follows:					
	ID	Opacity (%)	PM allowable (0.6 lb/10 ⁶ BTU)	SO ₂ Allowable lb/hr (2.3 lb/10 ⁶ BTU)	Uncontrolled Emissions lb/hr	
					PM	SO ₂
	B01	20	20.1	77.05	0.78	1.69
	B02	20	2.58	9.9	0.1	0.218
	B03	20	2.07	7.95	0.08	0.175
Standard No. 3 (state only)	This facility does not contain waste combustion or reduction sources at this time.					
Standard No. 4	Equipment in Unit IDs 05, 06, and 12 are subject to Standard 4 opacity limits based on the date the source was constructed, and to a PM limit for the emission units' IDs 05, 06 & 12, based on the equation in Section VII (B) of this regulation. The control device is not needed to comply with the Standard 4 PM					



STATEMENT OF BASIS
Page 28 of 29
 BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

Regulation	Comments/Periodic Monitoring Requirements
	limit because the uncontrolled PM emissions [lb/hr] (0.07, 0.280 & 0.099 respectively), are lower than the Standard 4 allowable emission rate at maximum throughput for these emission units (1,2, 1.57 & 3.6 lb/hr, respectively).
Standard No. 5	Not Subject. This facility has none of the specific sources listed in Section II of this standard, nor does it have VOC emissions greater than 550 lb/day.
Standard No. 5.2	Not Subject; All boilers were permitted to construct before 06/25/2004 and the burner assemblies have not been replaced.
Standard No. 7	Not Subject. Potential emissions from this facility do not exceed PSD thresholds. By taking a 100 tons per year VOC limit, the facility is limiting also the emissions below the 250 tons per year to avoid PSD major source applicability.
61-62.6	The fugitive PM (Dust) emissions will be controlled in a manner that should minimize the levels of PM (Dust) emissions.
40 CFR 60 and 61-62.60	Not Subject. This facility does not contain sources subject to this regulation; The boilers at the facility do not meet any of the applicability requirements NSPS Subpart Dc. Subpart Kb does not apply since the tanks that will be used for this process are less than the 75m ³ tank limits specified in Subpart Kb. This facility uses some of the chemicals listed in 40 CFR 60.489 as raw material ingredients. These chemicals can be present in the final product, but that does not trigger the applicability of VVa because it does not infer production of these chemicals. The intent of Subpart VV is to regulate the production of the chemicals listed in 40 CFR 60.489. The process units would be subject only if one of the listed chemicals is produced for sale as a final product or produced for use in the production of other chemicals.
40 CFR 61 and 61-62.61	This facility does not contain any processes/operations that emit the pollutants subject to this standard
40 CFR 63 and 61-62.63	Not Subject: This facility is not major for HAP emissions; It is not subject to subpart VVVVV because, per §63.11494(a)) to Subpart VVVVV of Part 63—National Emission Standards for Hazardous Air Pollutants for Chemical Manufacturing Area Sources, it does not process, use, or produce the HAP shown in Table 1 of the Subpart. The boilers at this facility are not Subject to JJJJJ – Industrial, Commercial, And Institutional Boilers; per the definition in 63.11237, boilers that burn natural gas with fuel oil as a backup are subject if they will burn oil outside of curtailment or gas supply emergencies. This boiler will not burn fuel oil outside of curtailment or gas supply emergencies and therefore, is not subject to this subpart. The facility will notify the Department if the boilers burns fuel oil outside of curtailment or gas supply emergencies and in that case this boiler will become subject to Subpart JJJJJ.
61-62.68	Not Subject: The facility does not store any 112 (r) regulated chemicals above threshold quantity
40 CFR 64	Not applicable; This is not a Title V facility.

AMBIENT AIR STANDARDS REVIEW

Regulation	Comments/Periodic Monitoring Requirements
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STATEMENT OF BASIS
Page 29 of 29
BAQ Engineering Services Division

Company Name:	CPJ Technologies	Permit Writer:	Snezana Popova
Permit Number:	CM-1200-0068	Date:	August 15, 2016

Regulation	Comments/Periodic Monitoring Requirements
Standard No. 2	This facility has demonstrated compliance with this standard through Modeling. Refer to Modeling Summary dated 04/08/2015
Standard No. 7.c	This facility has demonstrated compliance with this standard through Modeling. Refer to Modeling Summary dated 04/08/2015
Standard No. 8 (state only)	This facility has demonstrated compliance with this standard through Modeling. Refer to Modeling Summary dated 04/08/2015. This Standard is not applicable for the air toxics from boilers that burn virgin fuel.

To address community concerns about pollution levels, a worst-case emissions scenario was developed by using uncontrolled emissions in the model rather than a controlled scenario; the modeling, using the uncontrolled concentrations, showed that national criteria pollutant standards and state air toxic standards were being met.

PUBLIC NOTICE

This Conditional Major Permit will undergo a 30-day public notice period in accordance with SC Regulation 61-62.1, Section II.N. This permit was placed on the BAQ website on April 27, 2016. The comment period was open from April 27, 2016 to May 26, 2016. Comments were received during the comment period.

Additional Public Participation

- Community Meeting on May 9, 2016
- All comments received are addressed in the response to comments document.

SUMMARY AND CONCLUSIONS

It has been determined that this source, if operated in accordance with the submitted application, will meet all applicable requirements and emission standards.